MACKENZIE MOUNTAIN
NON-RESIDENT and
NON-RESIDENT ALIEN
HUNTER HARVEST SUMMARY
1996

Northwest Territories Resources, Wildlife & Economic Development

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MACKENZIE MOUNTAIN NON-RESIDENT and NON-RESIDENT ALIEN HUNTER HARVEST SUMMARY 1996

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ABSTRACT

Data on harvest of big game in the Mackenzie Mountains by non-resident hunters were recorded for the 1996 hunting season by each of the eight licenced outfitters that operate in the area and by Renewable Resource Officers with the Department of Resources, Wildlife, and Economic Development. The data recorded included: date(s) of harvest; tags held for each species; horn/antler measurements for Dall's sheep, woodland (mountain) caribou, moose, and mountain goats; age of Dall's sheep; location of kill sites; hunter effort; sex of mountain goats, wolves, wolverines, and black bears harvested; numbers of animals observed for each species (including grizzly bears); and a subjective rating of the overall hunting experience by each hunter.

Non-resident (i.e., non-resident plus non-resident alien) licences were bought by 387 hunters in 1996. Hunters from outside Canada (non-resident aliens) comprised 76.2% of all outfitted hunters in the Mackenzie Mountains and Canadians from outside the NWT, or NWT residents with less than 2 years residency (non-residents) comprised 23.8%. Of the 387 non-resident licence holders, 356 came to the N.W.T. and most spent at least some time hunting. *Outfitter Return on Client Hunter Success* forms were received for all non-resident licence holders in 1996. *Hunter Wildlife Observation Report* forms were voluntarily submitted by 253 non-resident hunters.

The number of non-residents buying big game hunting licences and the number of wolverines harvested in 1996 were each the highest recorded since 1991. The Dall's sheep harvest was the fourth highest recorded since 1967. Numbers of woodland caribou and moose taken in 1996 were only slightly higher than the mean for each species between 1991 and 1996. Numbers of wolves and mountain goats harvested were both below the species' means between 1991 and 1996. The average age of Dall's sheep rams and the measurements of horns or antlers for Dall's sheep, woodland caribou, and moose have remained essentially unchanged from the previous five years.

The overall impact of non-resident harvest on big game populations in the Mackenzie Mountains can not be determined based solely on the data collected by this type of survey. Systematic surveys to collect data on the internal population dynamics of hunted populations in the Mackenzie Mountains are required in order to ensure sustainable harvests.

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INTRODUCTION

The Mackenzie Mountains of the western Northwest Territories (NWT) existed as a Game Preserve from 1938 to 1953 with hunting privileges extended solely to aboriginal people (Simmons 1969). The mountains were opened to non-resident hunters in 1965 (Simmons 1969) and over the last three decades the Mackenzies have become known around the world for their hunting opportunities (especially Dall's sheep and woodland caribou) and for the wilderness experience they offer. Eight outfitters are currently licenced to provide big game outfitting services within the Mackenzie Mountains (Fig. 1; Appendix 2, Table 16). Each outfitter has the exclusive privilege to provide services within their zone; the average size of the zones is 10, 923 km^2 (range 7250 to 19,000 km^2; Appendix 2, Table 16).

Besides the primarily aboriginal general hunting licence holders, whose harvest is for subsistence purposes, there are three classes of licenced big game hunters in the NWT:

1) *resident* - Canadian citizens or landed immigrants who have lived in the NWT for at least two consecutive years prior to application for the licence;

2) *non-resident* - Canadian citizens or landed immigrants who live outside the NWT, or have not lived within the NWT for two consecutive years prior to application for the licence; and

3) *non-resident alien* - non-Canadian citizens or landed immigrants.

All holders of big game hunting licences must be at least 16-years-old. For simplification in this report, we call both non-resident and non-resident alien hunting licence holders 'non-residents' and combine their harvest statistics.

The Department of Resources, Wildlife, and Economic Development (DRWED) in Norman Wells (Sahtu Region) annually monitors non-resident big game harvest in the Mackenzie Mountains. Seasons for each big game species vary slightly and the total non-resident hunting season lasts from 15 July to 31 October. There are currently no restrictions on the numbers of Dall's sheep, woodland caribou, mountain goats, moose, wolves, wolverine, and black bears that an outfitter can take within his company's zone.

Individual non-resident hunters are annually restricted to one each of the following big

game species: Dall's sheep (male with at least 3/4 curl horns), woodland caribou (either sex), moose (male only), mountain goat (either sex), wolf (either sex), wolverine (either sex), and black bear (adult not accompanied by a cub or cubs). Non-resident hunting for grizzly bears was closed in 1982 as a result of concerns about over-harvest (Miller et al. 1982; Latour and MacLean 1994).

Each year the DRWED, under provisions laid out in the Northwest Territories *Wildlife Act*, requires that the outfitters submit an *Outfitter Return on Client Hunter Success* for each person that purchased a NWT non-resident big game hunting licence with them (Fig. 2). These forms (known as *Outfitter Returns)* must be submitted whether or not a client actually hunted and whether or not any game was harvested. This form has undergone considerable evolution over the past 30 years and was again extensively revised prior to the 1996 hunting season.

The *Outfitter Returns* provide a basis to annually monitor the activities of non-resident hunters in the Mackenzie Mountains and to assess the impact that their harvest has on wildlife populations in the mountains (Latour and MacLean 1994; Veitch and Popko 1996). In the absence of sufficient funds to do regular and extensive population inventories of harvested species in the Mackenzie Mountains, the *Outfitter Returns* and the measurements recorded by DRWED staff, guides, and hunters are the most consistent means we have to try to detect any population changes that may be occurring in harvested species, and to obtain trends in numbers of non-resident hunters and the species in which they are interested.

In addition to the *Outfitter Returns* we request all non-resident hunters to voluntarily provide reports of the wildlife they saw while hunting. These data are recorded on a separate form, the *Hunter Wildlife Observation Report* (Fig. 3).

This is the second consecutive year that a summary of the data collected by DRWED on non-resident hunters in the Mackenzie Mountains has been made available to all people and organizations interested in the outfitting industry and the region's wildlife populations (Veitch and Popko 1996). We hope that the information is of interest and use to the outfitters, the communities, land claim settlement area wildlife co-management boards, people involved in promotion of tourism in the western Arctic, to the hunters, and to anyone else with an interest in the Mackenzie Mountains.

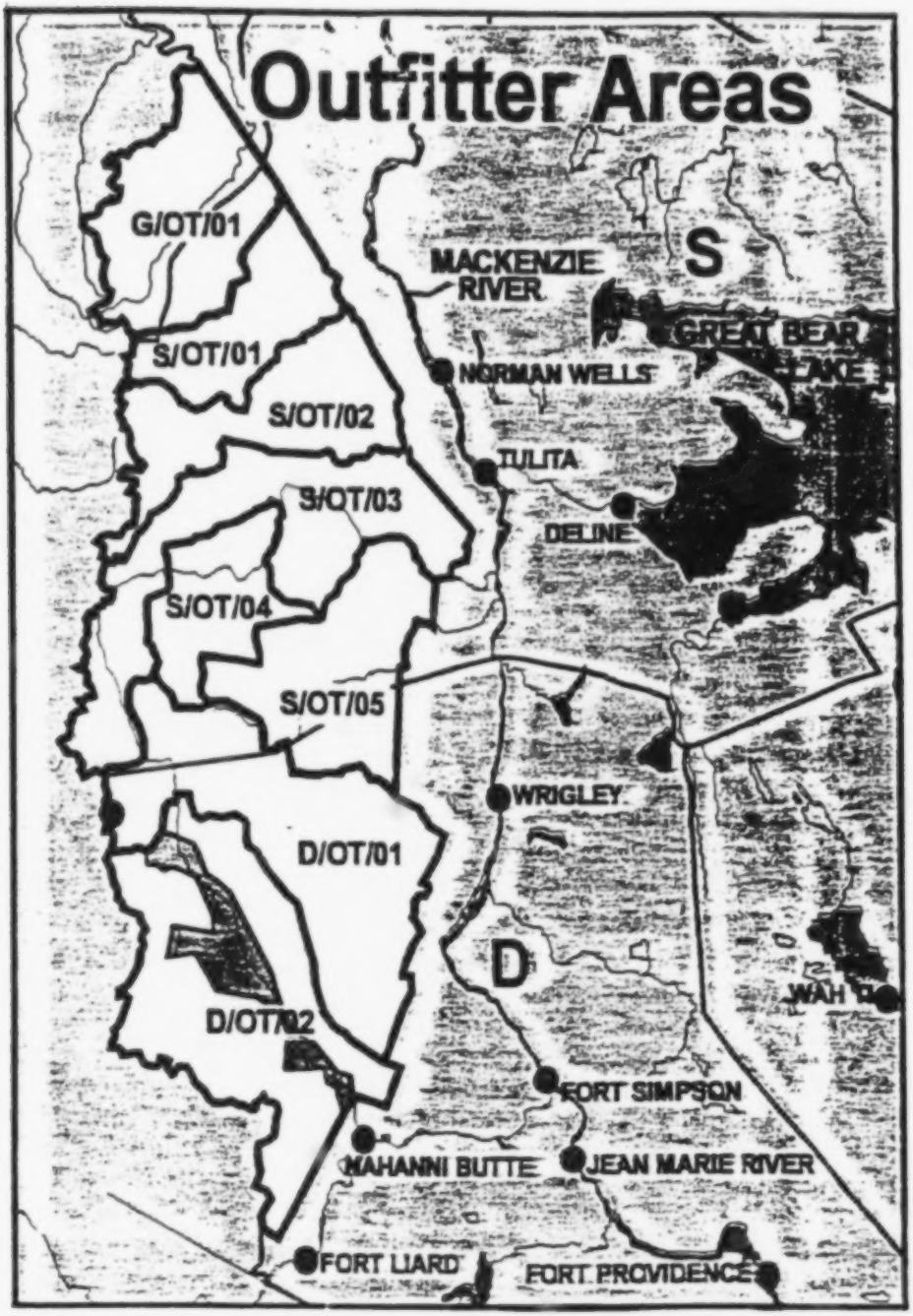

Figure 1. Outfitter zones in the Mackenzie Mountains, Northwest Territories.

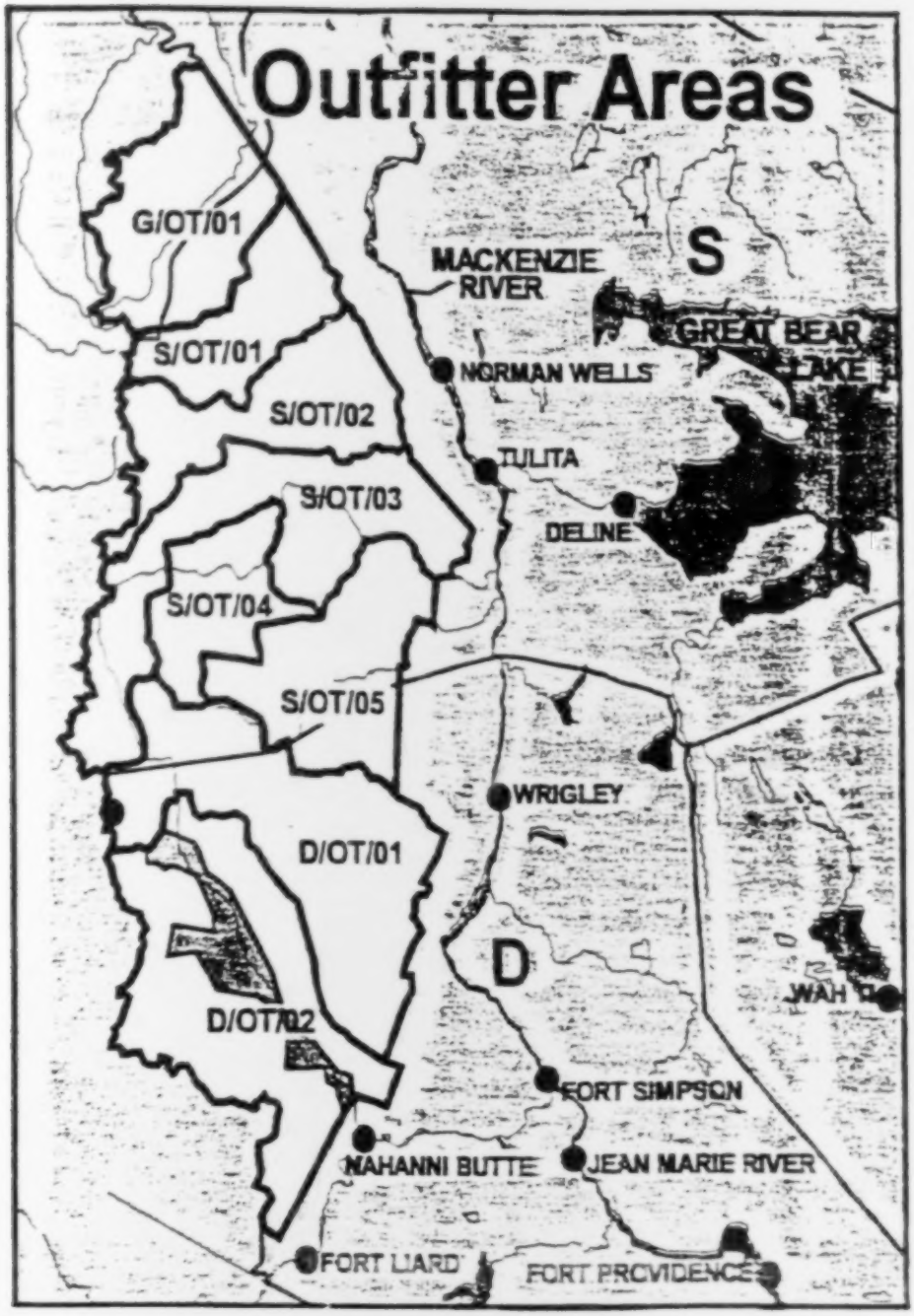

Figure 1. Outfitter zones in the Mackenzie Mountains, Northwest Territories.

DEPARTMENT OF RENEWABLE RESOURCES
PURSUANT TO THE WILDLIFE ACT
OUTFITTER RETURN
ON CLIENT HUNTER SUCCESS

MINISTÈRE DES RESSOURCES RENOUVELABLES
LOI SUR LA FAUNE
RAPPORT DU POURVOYEUR
SUR LES RÉSULTATS DE CHASSE D'UN CLIENT

OR XXXXXX

Figure 2. 1996 Mackenzie Mountain Outfitter Hunt Report form

MACKENZIE MOUNTAINS, N.W.T.
HUNTER WILDLIFE OBSERVATION REPORT
1996

The following information is requested by the Dept. of Renwable Resources, G.N.W.T. from you, the hunter, in order to assist us with management of Mackenzie Mountain big game populations. All the requested information is completely voluntary, but your providing it to us is most appreciated.

HUNTER INFORMATION

Last Name	First Name and Initials	
Address - number and street, box number	Town, City	Province, State, Country

Hunting Licence# _____ Outfitting Zone: _____ Company: _____

Start Date of Hunt _____ 1996 End Date of Hunt _____ 1996 Observations Made Over _____ Days

ESTIMATED NUMBER OF DALL'S SHEEP SEEN			
3/4 and Full Curl Rams	Less than 3/4 Curl Rams	Ewes	Lambs

ESTIMATED NUMBER OF WOODLAND CARIBOU SEEN		
Bulls	Cows	Calves

ESTIMATED NUMBER OF MOOSE SEEN		
Bulls	Cows	Calves

ESTIMATED NUMBER OF MOUNTAIN GOATS SEEN			
Billys	Nannys	Kids	Unknown Age

OTHER SPECIES

	Wolf	Wolverine	Black Bear Adult	Black Bear Cub	Grizzly Bear Adult	Grizzly Bear Cub
Number Seen						

How would you rate your overall hunting experience in the Mackenzie Mountains?
Excellent _____ Very Good _____ Good _____ Fair _____ Poor _____

Comments: _____

_____

_____

_____

_____

_____

_____

Thank You! Please give this form to the Officer or Clerk when you are exporting your trophies, or to the guide/outfitter with whom you hunted. We would appreciate receiving this form whether or not you harvested an animal(s).

Figure 3. 1996 Mackenzie Mountain Hunter Observation form

METHODS

Prior to the start of the 1996 hunting season, each outfitter in the Mackenzie Mountains received sufficient copies of the 1996 *Outfitter Return* and *Hunter Wildlife Observation Report* forms for all their clients for the year. The DRWED requires that the *Outfitter Returns* be returned by the tenth day of the month after the month of the hunt for each non-resident hunting licence holder. Those forms, and the voluntary *Hunter Wildlife Observation Reports*, were submitted to the senior author whether or not a client actually hunted and whether or not harvest occurred.

Once received, the data from the outfitter returns were cross-checked with the DRWED's *Game Licencing* central database (Yellowknife), with GNWT *Export Permits*, and Dall's sheep horn plug forms that are maintained by DRWED offices across the western NWT. After verification, all data were entered onto *Excel 5.0* (Microsoft Corporation) spreadsheets for analyses.

In cooperation with the outfitters, persistent attempts were made to obtain complete, signed forms for every non-resident that obtained a non-resident hunting licence.

RESULTS

Outfitter and Hunter Rates of Return for Forms

We received mandatory *Outfitter Returns* from 387 hunters, which represents a 100% rate of compliance. Voluntary *Hunter Observation Reports* were received from 253 (71.1%) of the 356 hunters that did at least some hunting in the Mackenzie Mountains.

Number and Nationality of Hunters With Mackenzie Mountain Outfitters

Non-resident and non-resident alien big game hunting licences for the Mackenzie Mountains, NWT were bought by 387 persons in 1996. Of those, 356 (92.0%) came to the NWT and most spent at least some time hunting; 31 (8.0%) either canceled their hunts or decided not to hunt after arriving in the NWT.

Non-resident aliens (N=295) and non-residents (N=92) comprised 76.2% and 23.8%, respectively, of non-resident hunters. Most (92.4%; N=85) Canadian hunters were from Alberta (N=57) and British Columbia (N=28). The majority (254 of 295; 86.1%) of non-resident aliens came from the United States, 33 (11.2%) came from Europe, 7 from Mexico, and 1 from Australia (Table 1).

Table 1. Origins of 387 non-resident and non-resident alien hunting licence holders in the Mackenzie Mountains, 1996

Canada	92	United States	254	Europe	33	Other	8
NWT/Yukon	0	Eastern States[1]	107	Austria	3	Mexico	7
British Columbia	28	Western States[2]	134	Germany	13	Australia	1
Alberta	57	State Unknown	13	Switzerland	1		
Saskatchewan	2			Spain	4		
Manitoba	0			Italy	8		
Ontario	5			Denmark	2		
Quebec	0			United Kingdom	1		
Atlantic Canada	0			Liechtenstein	1		

[1] AL, AR, CT, DE, DC, FL, GA, IL, IN, IA, KY, LA, ME, MD, MA, MI, MN, MS, MO, NH, NJ, NY, NC, OH, PA, PR, RI, SC, TN, VT, VA, VI, WV, WI

[2] AK, AZ, CA, CO, HI, ID, KS, MT, NB, NV, NM, ND, OK, OR, SD, TX, UT, WA, WY

Dall's Sheep (*Ovis dalli)*

Harvest and Effort

Dall's sheep tags were purchased by 65.1% (N=252) of all non-resident hunters. A minimum of 230 non-residents (91.3% of sheep tag holders) spent some time hunting Dall's sheep and they harvested 201 rams, which represents a success rate of 87.4%. The average length of a Dall's sheep hunt was 5.0 ± 3.0 days (range 1 to 13 days).

Horn Measurements

Table 2. Horn measurements of Dall's sheep rams harvested by non-resident hunting licence holders in the Mackenzie Mountains, 1996. (Note: horn measurements were taken by Department of Resources, Wildlife, and Economic Development (DRWED) personnel and are in centimeters.)

	Horn Length		Horn Circumference		Horn Spread
	Left	Right	Left	Right	
Number Measured	201	201	201	201	200
Mean (average)	89.5	88.7	33.5	33.4	59.1
Standard Deviation	8.9	8.8	2.0	2.0	8.0
Maximum Measure	109.0	107.5	39.0	37.0	83.5
Minimum Measure	36.0[1]	33.0[1]	20.0[1]	21.0[1]	41.0

[1] Measurements from an illegal ram (horns < 3/4 curl) that was turned in by the hunter and confiscated by DRWED.

Age of Harvested Rams

The average age of 200 rams taken by non-residents and that were aged by DRWED personnel was 9.5 ± 1.5 years (range 3.5 to 13.5 years). Sixty-nine (34.5%) of the known-age harvested rams were over 10-years-old and 7 (3.5%) were over 12-years-old. The age-structure of the 1996 harvest, as well as for 1991-1995, is presented in Appendix 3, Table 19.

Horn Brooming

Brooming (i.e., breaking of horn tips) occurred on 33.8% (68 of 201) of left and 38.3% (77 of 201) of right horns. The difference in the proportions of right and left horns that were broomed is not statistically significant ($z = 0.184$; $P > 0.10$).

Table 3. Dall's sheep observations reported by non-resident hunting licence holders in the Mackenzie Mountains, 1996.

Age/sex Class	Number of Hunters Reporting	Total Number Observed	Mean Number Observed	Percent of Sheep Classified
Rams	224	4374	19.5	36.3
Ewes[1]	200	5320	26.6	44.1
Lambs	162	2358	14.6	19.6
Unknown	13	727	55.9	n/a

[1] This category includes females >1-yr-old, yearlings, and younger rams. Also known as 'nursery sheep'.

Table 4. Classification of Dall's sheep rams observed by non-resident hunting licence holders in the Mackenzie Mountains, 1996.

Ram Class	Number of Hunters	Total Number	Mean Number	Percent of Total
Horns over 3/4	172	1713	10.0	50.2
Horns less than	174	1699	9.8	49.8

A lamb to ewe ratio of 44 per 100 was calculated from hunters' observations of 2358 lambs and 5320 ewes. The ram to ewe ratio was 82 per 100.

Woodland Caribou (*Rangifer tarandus caribou)*

Harvest and Effort

Woodland caribou tags were purchased by 70.8% (N=274) of non-residents. At least 213 caribou tag holders hunted woodland caribou in 1996 (77.7% of tag holders) and they harvested 172 bulls, which represents an 80.8% success rate. The average length of woodland caribou hunts was 4.3 $\pm$ 3.1 days (range 1 to 14 days).

Antler Measurements

Table 5. Antler measurements of woodland caribou bulls harvested by non-resident hunting licence holders in the Mackenzie Mountains, 1996. (Note: antler measurements were taken by licenced guides and are in centimeters)

	Total Length (contour)		Antler Spread (tip to tip)
	Left Antler	Right Antler	
Number Measured	128	128	15
Mean (average)	116.4	116.3	91.5
Standard Deviation	12.4	11.8	21.9
Maximum Measure	144.0	142.0	147.0
Minimum Measure	81.5	80.0	52.0

Observations of Woodland Caribou

Table 6. Woodland caribou observations reported by non-resident hunting licence holders in the Mackenzie Mountains, 1996.

Age/sex Class	Number of Hunters Reporting	Total Number Observed	Mean Number Observed	Percent of Total Classified
Bulls	217	6622	30.5	21.4
Cows	212	16,735	78.9	54.2
Calves	187	7540	40.3	24.4

From the hunters' observations we calculated that there were 45 calves and 40 bulls per 100 cows.

Moose (*Alces alces)*

Harvest and Effort

Moose tags were purchased by 18.2% (N=74) of non-resident hunters. At least 60 of those tag holders hunted moose in 1996 (81.1% of tag holders) and they harvested 46 bulls, which represents a 76.7% success rate. The average length of a moose hunt was 4.3 $\pm$ 2.7 days (range 1 to 12 days).

Antler Measurements

Table 7. Antler measurements of moose bulls harvested by non-resident hunting licence holders in the Mackenzie Mountains, 1996. (Note: antler measurements were taken by licenced guides and are in centimeters)

	Antler Spread (tip to tip)
Number Measured	29
Mean (average)	142.4
Standard Deviation	17.5
Maximum Measure	188.0
Minimum Measure	104.0

Observations of Moose

Table 8. Moose observations reported by non-resident hunting licence holders in the Mackenzie Mountains, 1996.

Age/sex Class	Number of Hunters Reporting	Total Number Observed	Mean Number Observed	Percent of Total Classified
Bulls	107	363	3.4	37.5
Cows	88	481	5.5	49.7
Calves	60	124	2.1	12.8

From the hunters' observations we calculated that there were 26 calves and 76 bulls per 100 cows.

Mountain Goat (*Oreamnos americanus*)

Harvest and Effort

Mountain goat tags were purchased by 3.5% (N=14) of non-residents. At least 5 tag holders hunted mountain goats in 1996 (35.7% of tag holders) and they harvested 4 goats, which represents a success rate of 80.0%. Two goats taken were females, one was a male, and the sex of the other was not reported. The average length of a goat hunt was 2.2 ± 0.8 days (range 1 to 3 days).

Horn Measurements

Table 9. Horn measurements of mountain goats harvested by non-resident hunting licence holders in the Mackenzie Mountains, 1996. (Note: horn measurements were taken by licenced guides and are in centimeters)

	Total Length	
	Left Horn	Right Horn
Number Measured	2	2
Mean (average)	17.5	17.5
Standard Deviation	-	-
Maximum Measure	20.0	20.0
Minimum Measure	15.0	15.0

Observations of Mountain Goats

A total of 48 and a mean of 4.8 mountain goats (range 0 to 16) were observed by the 10 hunters that reported their observations. All mountain goats were seen in only three of the eight outfitting zones (S/OT/04, D/OT/01, and D/OT/02) and 81.3% were observed in the two southernmost zones.

Table 10. Summary of classifications from non-resident hunter observation reports in the Mackenzie Mountains, 1996

Dall's Sheep		Woodland Caribou		Moose	
Lambs: 100 Ewes	Rams: 100 Ewes	Calves: 100 Cows	Bulls: 100 Cows	Calves: 100 Cows	Bulls: 100 Cows
44	82	45	40	26	76

Carnivores

Wolf (Canis lupus)

Wolf tags were purchased by 49.9% (N=193) of non-resident hunters. At least 72 of those hunted wolves in 1996 (37.3% of tag holders) and they harvested 11 wolves, which represents a 15.3% success rate. Five wolves taken were males, four were females, and the sexes of two were not recorded. The average length of a wolf hunt was 6.1 $\pm$ 3.7 days (range 1 to 18 days).

A total of 186 and a mean of 2.4 wolves (range 0 to 18) were observed by the 76 hunters that reported their observations of wolves; 81.6% (N=62) of those hunters saw at least one wolf. Wolves were reported from all eight zones. The two southernmost zones (D/OT/01 and D/OT/02) had reports of only 10 wolves between them, whereas one zone in the Sahtu had reports of 56 wolves.

Wolverine (Gulo gulo)

Wolverine tags were purchased by 29.5% (N=114) of non-resident hunters. At least 43 of those tag holders hunted wolverines in 1996 (37.7% of tag holders) and they took a total of four wolverines, which represents a 9.3% success rate. Two of the wolverines harvested were males, one was a female, and the sex of the other was not reported. The average length of a wolverine hunt was 6.6 $\pm$ 3.9 days (range 1 to 18 days).

A total of 34 and a mean of 0.9 wolverines (range 0 to 4) were seen by the 36 hunters that reported their observations; 72.2% of those hunters saw at least one wolverine. Wolverines were observed in all eight zones and between 2 and 6 wolverines were reported per zone. All five zones in the Sahtu had reports of either 5 or 6 wolverines.

Black Bear (Ursus americanus) and Grizzly Bear (U. arctos)

No black bear tags were purchased by non-resident hunters in the Mackenzie Mountains in 1996. The Mackenzie Mountains are not open to non-resident hunting of grizzly bears.

Table 11. Black bear and grizzly bear observations reported by non-resident hunters in the Mackenzie Mountains, 1996.

	Black Bear		Grizzly Bear	
	Cub	Adult	Cub	Adult
Total Number Seen	1	10	96	377
Number of Hunters Reporting	6	14	49	132
Number of Hunters That Saw at Least One	1	9	46	129
Mean (average) Number Seen	1.0	1.1	2.0	2.9
Standard Deviation	-	0.3	1.0	2.4
Maximum Number Seen	-	2	5	15
Minimum Number Seen	-	1	1	1
Percent of the Total Number Seen	9.1	90.9	20.3	79.7

Productivity of grizzly bears in the Mackenzie Mountains can be annually indexed by the proportion of all bears observed that were cubs (i.e., juveniles still accompanied by their mother). Overall about 1 grizzly bear in 5 was classified by the non-resident hunters as being a cub (Table 11). For individual outfitting zones the proportions ranged from a low of 10.8% (9 cubs and 74 adults) to a high of 30.8% (12 cubs and 27 adults).

While very few black bears were observed, all of them were reported in the three most southerly zones. As would be expected in what appears to be marginal habitat for black bears, only one cub was observed compared to 10 adult black bears (Table 11).

Mackenzie Mountain Non-resident Hunter Tag Preferences, Harvest, Success, and Effort

Table 12. Summary of 387 non-resident hunting licence holder tag preferences, total harvest, success rates, and effort in the Mackenzie Mountains, 1996.

Species	Number of Tags Sold	Percent of Hunters That Bought Tag	Number of Tag Holders That Hunted	Number of Animals Harvested	Percent Success	Mean Number of Days Hunted ± SD
Dall's Sheep	252	65.1	230	201	87.4	5.0±3.0
Woodland	274	70.8	213	172	80.8	4.3±3.1
Moose	74	19.1	60	47	78.3	4.3±2.7
Mountain Goat	14	3.6	5	4	80.0	2.3±1.0
Wolf	193	49.9	72	11	15.3	6.1±3.7
Wolverine	114	29.5	43	4	9.3	6.6±3.9
Black Bear	0	0	-	0	-	-

Table 13. Outfitted non-resident hunter harvests in the Mackenzie Mountains, 1991-1996.

Year	Number of Hunters	Dall's Sheep	Woodland Caribou	Moose	Mountain Goat	Wolf	Wolverine
1991	354	170	175	40	6	14	3
1992	364	203	142	32	4	7	0
1993	382	191	189	56	9	7	3
1994	355	195	164	46	5	15	2
1995	344	190	180	49	6	14	1
1996	387	201	172	47	4	11	4
Mean 1991-1996	364	192	170	45	6	11	2

Table 14. A comparison of horn and antler measurements among the period 1979-90 (as reported in Latour and MacLean 1994), the 1995 season (Veitch and Popko 1996), and the 1996 season for ungulate species (i.e., hoofed animals) harvested by non-resident hunting licence holders in the Mackenzie Mountains. All measurements are in centimeters unless otherwise shown and the sample size is given in brackets.

Measurement	1979-1990 Mean	1995	1996
Dall's sheep right horn length	90.4 (1755)	89.3 (189)	88.7(201)
Dall's sheep horn annuli age (years)	9.5 (1755)	9.7 (189)	9.5 (200)
Woodland caribou right antler length	114.5 (1037)	116.5 (171)	116.3 (128)
Moose antler spread	139.8 (236)	143.7 (47)	142.4 (29)
Mountain goat right horn length	20.3 (17)	21.4 (5)	17.5 (2)

Non-resident Hunter Satisfaction

On the *Hunter Wildlife Observation Report* each hunter was asked to rank his or her experience in the Mackenzie Mountains from poor to excellent. Responses were received from 227 hunters (89.7% of hunters that submitted those forms) and 93.9% expressed a high degree of satisfaction with their outfitter and their overall hunting experience (Table 15). Dissatisfaction was reported by only 3.9% of non-resident hunters. A summary of comments received is provided in Appendix 1.

Table 15. Mackenzie Mountain outfitted non-resident hunter satisfaction levels, 1996.

Ranking	Number of Responses	Percent of All Responses
Excellent	174	76.7
Very Good	39	17.2
Good	5	2.2
Fair	6	2.6
Poor	3	1.3

DISCUSSION

Hunters

World-wide interest in hunting in the Mackenzie Mountains continues to grow (Table 13) and 1996 saw the highest number of non-resident big game hunting licences recorded since 1979. Proportions of non-resident aliens and non-residents in 1996 were very similar to previous years - Latour and MacLean (1994) reported a 12-year average of 22% non-resident hunters in the Mackenzie Mountains between 1979 and 1990. Hunters came to the Mackenzie Mountains from 12 countries on three continents in 1996 (Table 1); however, the majority of non-resident aliens are from the United States, which has been the case since 1965.

Non-resident hunters are very satisfied with their hunting experiences in the Mackenzie Mountains as was quite clearly expressed by the 93.9% of 227 respondents that rated their time in the Mackenzies as either excellent or very good (Table 15). Only 9 hunters (3.9%) were dissatisfied and ranked their experience as either fair or poor - those hunters tended to either have had problems with their guide, with weather, or with the timing of their hunt (see Appendix 1). Many hunters commented that they would like to return for another trip (Appendix 1) and each year there is usually a relatively high number of repeat clients with outfitters in the Mackenzie Mountains (Kelly Hougen, pers. comm.).

Dall's Sheep

The proportion of non-residents that bought tags for Dall's sheep (65.1%) was virtually unchanged from the 63.4% that did so in 1995 (Veitch and Popko 1996); however, 15 more people hunted Dall's sheep in 1996 than in 1995 and 11 more rams were harvested (Table 13). In 1996 overall hunter success for Dall's sheep (87.4%) was down slightly from 92.7% in 1995 (Veitch and Popko 1996); however, it does not seem that there was a lack of legal rams to choose from - hunters reported seeing an average of about 10 legal rams each, and legal rams constituted slightly over 50% of all rams seen and reported (Table 3). Hunter effort for Dall's sheep remained relatively unchanged from previous years at 5.0 days; for the periods 1979-1985 and 1988-1990 it was 5.3 days (Latour and MacLean 1994).

The average age of harvested rams was also down slightly in 1996 (9.5 years) from 1995

(9.7 years) but the proportion of rams taken that were over 10-years-old was the same in each of the last two years (35%). The average age of Dall's sheep harvested has increased by about one full year from the period 1967-1968 (8.4 years; Simmons 1969) but is down from the three year period 1988-1990 when the average age of harvested rams was over 9.8 years (Latour and MacLean 1994; Appendix 3).

Horn measurements (Table 2) were also essentially unchanged in 1996 from previous years although brooming (i.e., horn breakage) was noted on 5% more left and 6% more right horns than in 1995. Geist (1971; 49) reported that horn brooming is, "occasional in Dall's sheep, common among Stone's sheep, and the rule for all bighorns." Bunnell (1978) measured 567 increments of horn growth on 53 male Dall's sheep in the Kluane Lake area of the Yukon and found that, on average, rams had lost 94% of the lamb (first year) horn increment by age 12, and for about 50% of the rams age 7 or more - a portion of the 2nd annulus was also absent. Brooming generally occurs as a result of fighting between rival males; males with broken horns often pay a price for the breakage since among rams of comparable body size and age, those with larger horns generally win fights and contests (Geist 1993).

Hunters' reported observations of Dall's sheep are potentially useful in examining the population dynamics of sheep in the Mackenzie Mountains, but we have to fully understand and recognize the biases and problems with those data. Sheep hunters focus on mature rams and, therefore, hunt those areas where rams are most likely to be found - in July and August, when most sheep hunting occurs, ram groups are usually segregated from ewe/lamb groups (Geist 1971; Simmons 1982; Barichello et al. 1987). This bias will tend to inflate ram to ewe ratios. Most groups of sheep are reported by more than one hunter, which biases classification and also means that there is no way to use those data to assess overall numbers of sheep. A total of 12,779 sheep observations were reported to us in 1996 (Table 3) and 12,206 in 1995.

Jorgenson (1992) summarized 17 years of lamb: ewe classification data for a hunted big horn sheep population in west-central Alberta and found a mean of 45 lambs per 100 ewes (including yearlings; range 34 to 56) in June and 43 per 100 (range 25 to 54) in September; our lamb to ewe ratio for July-August 1996 was 44 per 100, which was down from the ratio of 55 per 100 from 1995. Jorgenson (1992) found that June and September lamb:ewe ratios were good

predictors of recruitment to the next year. However, he also found that the data were difficult to interpret due to inability to correctly classify younger animals such as yearlings and 2-year-olds and he suggested that it is important to try to classify yearlings in any survey.

In 1995 we had hunters report observations of yearlings (Popko and Veitch 1996) but compared to the average of 176 hunters that reported observations of rams (30.4% of all animals classified), lambs (24.8%), and ewes (36.9%) only 119 reported observations of yearlings; in addition, yearlings comprised only 7.8% of all animals classified, which is likely an underestimate of unknown magnitude. Latour (1992) aerially surveyed 4956 km^2 of the northernmost outfitting zone for sheep in June 1998 and found 48 lambs per 100 nursery sheep (includes yearlings) and concluded that was indicative of high productivity and similar to lamb:ewe (i.e., not including yearlings) ratios of other studies. Latour (1992) classified yearlings and had 19.3% of all 934 sheep observed in this category and 23% lambs.

An August 1991 aerial survey of the Richardson Mountains provided lamb and ram to 100 nursery sheep (ewe) ratios of 43 and 55, respectively (Nagy and Carey 1991) and the authors felt that rate of lamb production would allow for their observed 10.5% average annual rate of increase in the population for the period 1986 to 1991.

Woodland Caribou, Moose, and Mountain Goats

Caribou tags are purchased by proportionately more non-residents than are Dall's sheep tags; as has been the case for five of the last six years (Veitch and Simmons, in prep.). The number of caribou taken in 1996 (N=172) was down slightly from the 180 taken in 1995 (Table 13) and there was a marked drop in the hunter success rate from 94.7% to 80.8%; however, the effort to obtain caribou did not increase from 1995 (4.5 days) to 1996 (4.3 days), nor was there any decrease in mean antler measurements. The 217 hunters that reported observations of bull caribou saw an average of 31 bulls each (Table 6), so the decrease in hunter success for 1996 may be a result of increased hunter selectivity on antler (i.e., trophy) size.

It is of some concern that only 40 bulls per 100 cows (or 1 male per 2.5 females) were observed by non-residents and that bulls only comprised 21.4% of all animals classified (Table 6). As is shown in Table 10, both Dall's sheep and moose had >1-year-old male per 100 >1-year-old

female ratios of 82 and 75, respectively. Bergerud (1978) summarized data for eight North American caribou populations that were either non-hunted or hunted non-selectively (i.e., both bulls and cows taken) and found the mean percentage of adult males was 39%. Collin (1986) studied woodland caribou in the Mackenzie Mountains in 1973 and his summer (1 Jul to 3 Sep) adult classification gave 61 males per 100 females (1 male per 1.6 females). We need to examine available caribou observation data from the Mackenzie Mountains for previous years in order to determine if the 1996 results from the non-resident hunter survey are unusual.

Moose are hunted after 1 Sep by non-residents and tags for moose are bought by a minority of hunters (Table 12). Moose harvests in the mountains have remained relatively stable over the last six years (Table 13) with 40 to 50 harvested per year. Success rates for moose are generally lower than for caribou and sheep - the 1996 rate dropped slightly to 78.3% from 81.4% in 1995 (Veitch and Popko 1996), while hunter effort for moose remained relatively constant at 4.3 days. The slightly lower success rate in 1996 is perhaps as a result of the generally poor weather that many of the hunters experienced in September and October (Appendix 1).

The low percentage of moose calves observed (13.1% or 26 per 100 cows) and the fact that 90 hunters reported observations of cows but only 54 reported calves (Table 8) is of some concern given that studies of a moose population in the Norman Wells area of the Mackenzie Valley have observed over 40 calves per 100 cows in November 1984, 1989, and 1995 (Veitch et al. 1996). However, there could be a significant bias in the non-resident hunters' observations if there is a high degree of sexual segregation of moose in the mountains prior to the onset of the rut later in the fall.

Mountain goats only occur in rugged habitats in a small portion of the southern Mackenzie Mountains and generally less than 5% of all hunters buy a tag for the species. The degree of difficulty in hunting mountain goats is perhaps shown by the less than 40% of tag holders that actually pursued the species in 1996, but they were generally successful (80%) once they made the effort (Table 12). While the goat harvests in 1992 and 1996 (N=4) were the lowest for the last six years (mean of 6 per year; Table 13), the number harvested since 1991 has increased sharply from the 1980's: 34 goats have been taken from 1991 to 1996 (average of 5.7/yr), whereas for the 12-year period 1979-1990 only 17 (average 1.4/yr) were known to have been taken (Latour and MacLean 1994). However, for the 11-year period 1965-1975 non-residents harvested 46 goats (average

4.2/yr) in the Mackenzie Mountains (Wigal and Collins 1982). The reason for the sharp drop in mountain goat harvest through the 1980's is unknown. No surveys have been done in the Mackenzies to estimate goat numbers or population trends and the only published estimate is 400+ (Wigal and Coggins 1982).

Only two of the four goats harvested in 1996 was measured for horn length and those had an average horn length of 17.5 cm (Table 9). Horn lengths of adult male and female mountain goats typically range from 20 to 30 cm (Rideout 1978); the mean length of 17 goats harvested between 1979 and 1990 was 20.3 cm (Latour and MacLean 1994).

Carnivores

Wolf tags were purchased by 50% of non-residents in 1996, which was up considerably from the 21% that did so in 1995 (Veitch and Popko 1996). In 1996 only 36% of tag holders hunted and only 11 wolves were harvested (15.3% success) versus the 79% of tag holders that hunted in 1995 with a harvest of 14 (25.0% success). Harvest of wolves in the Mackenzies typically fluctuates considerably among years (Table 13) but there has apparently been an overall increase in harvest over the past six years (average of 11 per year) versus the period 1979-1990 (average of 7.6 per year; Latour and MacLean 1994).

In 1995 a total of 269 wolves were reported by the 77 of 119 hunters that saw at least one wolf (mean of 2.3 wolves per hunter; Veitch and Popko 1996), whereas in 1996 only 186 wolves were reported by the 63 of 76 hunters that saw at least one wolf (mean of 2.4 wolves per hunter).

Wolverine tag purchases by non-residents also increased sharply in 1996 versus 1995 with sales to 29.5% (N=114) and 10.2% (N=35), respectively, of all non-resident licence holders. The success rate for wolverine harvest remained low (9.3%); however, the number taken (N=4) was the highest since 1991 and double the 1991-1996 annual mean of 2 (Table 13). In 1995 wolverines (N=21) were seen by 24% of 80 reporting hunters (Veitch and Popko 1996); this increased to 72.2% of 36 hunters that reported in 1996 (N=34 wolverines observed).

Black bears are generally restricted to the southern half of the Mackenzie Mountains and are quite rarely observed even where they do occur (Table 11) - only 11 black bears were reported in both 1995 and 1996. It is hypothesized that interspecific competition with the grizzly bear, which is

larger, more aggressive, and more adapted to alpine and open habitats (Herrero 1972, 1978; Veitch and Harrington 1996) serves to limit the distribution and numbers of black bears in the Mackenzie Mountains.

Grizzly bears were commonly seen by hunters and a total of 473 observations of grizzlies were reported in 1996 compared to 389 in 1995. Hunters saw a mean of 2.9 adult grizzlies in 1996 and 129 of 132 (97.8%) hunters that provided their observations saw at least one adult bear. Reports of grizzly bears were not uniformly distributed over the eight outfitting zones - the two southernmost zones had reports of only 12 adults and 4 cubs between them, whereas three of the five zones within the Sahtu each had reports of over 70 adult grizzly bears (range 72 to 112). Many non-resident hunters are concerned about the numbers of grizzly bears they encounter during their time in the mountains and requests for a reinstatement of the non-resident hunting season are frequent as most of both hunters and outfitters are of the opinion that there are "too many grizzly bears in the Mackenzie Mountains" (Kelly Hougen, pers. comm.; also see Appendix 1).

In 1996 we asked hunters, for the first time, to partition their observations of bears (black and grizzly) into 'cubs' and 'adults' (we assume any juvenile seen in the company of an adult female will be reported as a 'cub') and 20.3% of all grizzly bears reported were classified as 'cubs'. In the Mackenzie Mountains juvenile grizzlies generally stay with their mothers for 3 years (Miller et al. 1982), therefore, 'cubs' would refer to cubs-of-the-year, yearlings, and 2-year-olds. Nagy et al. (1983a, 1983b) studied numerically stable grizzly bear populations in the northern Yukon and NWT. They determined that 28.3% (Yukon) and 40.6% (NWT) of their study populations were cubs in these three age cohorts. Nagy et al. (1983a) summarized population data from three other studies of grizzly bears and found that: in Yellowstone National Park an increasing population had 41.8% cubs, yearlings, and 2-year-olds; in the Eastern Brooks Range of Alaska a decreasing population had 37.6%; and in the Western Brooks Range a population (whose trend was unknown) had 37.4% of bears in these age classes. The only extensive study of grizzly bears in the Mackenzie Mountains documented 24.7% of the population as cubs and yearlings (Miller et al. 1982). Therefore, it appears that the numbers of cubs to 2-year-olds observed in the Mackenzies by non-residents in 1996 is at the low end for northern grizzly bear populations. Miller et al. (1982) found that grizzly bears in the Mackenzies have a very low reproductive rate with cubs not produced by

any females less than 8-years-old, a mean litter size of 1.83, and an average inter-litter interval of 3.8 years.

Summary

The summary data presented in Table 13 for the period 1991 to 1996 are different than reported in Veitch and Popko (1996; Table 9) for the period 1991 to 1995 as a result of a six-year complete review of non-resident harvest in the Mackenzie Mountains that is currently underway (Veitch and Simmons., in prep.). As part of this review we have cross-checked and verified information on every hunter harvest report form received since 1991 (i.e., since the period covered by Latour and MacLean's (1994) 12-year review for 1979-1990) with our NWT wildlife *Export Permits*, from plugs inserted into all Dall's sheep horns exported from the NWT, and from the central NWT *Game Licencing* database. This resulted in our identifying 102 more non-resident hunting licence holders from 1991 to 1994, 5 more Dall's sheep, 38 more woodland caribou, 19 more moose, 14 more wolves, and 2 more wolverines than was reported in Veitch and Popko (1996; Table 9).

The data in Table 13 of this report do not exhibit the trend of a substantial increase in the numbers of licenced non-resident hunters, woodland caribou harvested, moose harvested, and wolves harvested that was discussed in Veitch and Popko (1996). The data now indicate a much greater degree of consistency among the years 1991 to 1996. A fuller discussion of these and analysis of all other data collected for the period 1991 to 1996 will be presented in Veitch and Simmons (in prep).

While the results from 1996 indicate that the numbers of big game species harvested, average age and antler/horn measurements have not appreciably increased or decreased, and the level of hunter effort has remained fairly constant - we still cannot assess the overall impact of non-resident harvest on big game populations in the Mackenzie Mountains based solely on the data collected by this type of survey (Latour and MacLean 1994; Veitch and Popko 1996). We still require systematic surveys to collect data on the internal population dynamics of hunted populations in the Mackenzie Mountains.

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PERSONAL COMMUNICATIONS

Kelly Hougen, President, Association of Mackenzie Mountain Outfitters, Whitehorse, YT.

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Appendix 1. Comments made by non-resident hunters in the Mackenzie Mountains on *Hunter Wildlife Observation Report* forms, 1996

The following comments are taken from the hunters' forms and are direct quotes in most cases, except where spelling or grammar were corrected. Some duplicate comments have been omitted.

"A super ram, like a bighorn"
"Weather was bad, hunted mostly on 2 days"
"Passed up a 40 yd shot at a very old ram, heavy broomed; saw 2 super rams but no luck"
"Harvested sheep had an infected lower jaw"
"I got my caribou and I got my Dall's sheep!"
"Excellent 11-year-old ram"
"Bad weather, great experience, beautiful country, lots of wildlife"
"Very bad weather"
"Extremely bad weather, snowed for 5 days"
"Excellent outfitter with superb guides in beautiful territory. A terrific experience. Very bad weather"
"Winter comes too soon here!"
"Excellent except for the weather"
"Excellent organization, great company, very safe, beautiful country. I would recommend this outfit to a friend"
"Very bad weather. Spent 5 days in a tent."
"This was one of the toughest hunts I've ever been on. But it was well worth it!"
"Too short, bad weather"
"Bad weather, lots of caribou"
"Excellent lamb survival rate, a lot of the rams that I saw were older age class 10 years plus"
"Large grizzly bear sighted near Orthogonal River, grizzly bear everywhere"
"Beautiful country with abundant game; only negative is that there is so many bears - they bothered us almost daily"
"Excellent guides, good food, scenery out of sight. The scarcity of game was a little upsetting and not expected"
"Lost about 30% of my moose meat to a grizzly, was stalked by a sow with cubs but was able to avoid possible dangerous situation without harm to either"
"Very pleased with the outfitter and guide, game was very abundant, I wish the bear management people would consider a hunting season on bear"
"Had a great trip, saw lots of game, got a great ram and caribou. First class operation"
"X runs a top notch operation, excellent area to hunt, camps are great, I really enjoyed my experience in the Mackenzie Mountains"
"Saw too many grizzly bears, one of which took all my caribou meat. Same day in evening one large grizzly came into camp at 15'. Lucky no one was hurt"
"Lots of grizzly. Maybe should harvest some grizzly bears"
"Grizzly bears need to be harvested. Saw 400 caribou"
"This outdoor adventure was at the top of the list of any experience I have ever had. Lots of animals, excellent guide, wish to return for another hunt"
"You should open a grizzly bear season"
"Lots of game. Tons of bear sign although I did not see any"
"Top notch outfit. Had a great time. Seen lots of game"
"Lots of grizzly sign. You should not have to live here for 2 years to be a resident"
"Lost two days of hunt due to airline lost baggage"
"I had a very good time. Saw a lot of game and great country. Weather could have been better. Hunt was too short"
"The valleys are long and the mountains high, but a dynamite experience!"
"There should be a quota for grizzlies. We were sheep hunting and still ran into 10. There wasn't a single day rain or shine that we did not see a good variety of big game animals. The camps were clean, guides were excellent company, this is the best hunt ever!"
"Beautiful country, outfitter excellent, but guide laziest person on earth and ruined my trip"

"The amount of grizzlies seen was great. Lots of mature boars. A nuisance around camp"
"Beautiful country, hope it can stay the way it is, so peaceful and fine. Outfitter did a great job"
"We had a young grizzly bear 'charge' the camp after the caribou kill. Beautiful animal - came within 80 yards"
"Great sheep country!"
"10 day hunt, 5 days stayed in camp due to snow, rain, fog, etc. Ate most of my sheep during this time due to bad weather, stayed on to hunt caribou 3 more days and got nice bull on 29th. Grizzly bears becoming a problem in camp"
"Tremendous amount of grizzly sign, unseasonably warm, small bulls and cows, big bulls stayed up high"
"Mountains are beautiful, expected to see more and bigger game. Guide was not an experienced moose guide. Guide related problems made it a very bad hunt"
"Good trip, no problems, I would return for another hunt. Grizzly ate about half of my moose overnight"
"Two hunters sent to area only good for one, guide failed to pursue for fear of disturbing other hunter. Only opportunity was 400+ yard shot as sheep moved"
"X is an excellent guide and wonderful person to share this experience with. Suggest that you recommend best boots to use and gloves. I value this experience"
"Great hunting experience, beautiful part of the world, outfitter and guides were superb"
"X (outfitter) is by far the best. This is my 2nd hunt in 12 years and would do it again. Would be nice if some grizzly hunt permits could be issued"
"A lot of game seen of each species. Spectacular country. Top notch guide. Enjoyed every minute. First class outfitter and I recommend his services to anyone"
"Wonderful country. Unbelievable, terrific time!"
"Hunting was excellent. Considerable bad weather"
"Great hunting area and outfitter. I will plan to return in the future"
"Wish the hunting was as good in Australia!"
"Would like to come back for another hunt"
"Saw lots of mature bull caribou, had an excellent time, excellent guiding and outfitting"
"Abundant game, great country, great people, fantastic outfitter"
"Beautiful country, lots of game, quality hunt, first class, great outfitter. People in Norman Wells are friendly too. Hope to be back soon"
"Size of the country is overwhelming. Spectacular vistas, plenty of game, outfitter was first class and everyone in the outfit was highly competent"
"Open up grizzly bear hunting! We saw lots of sign. This would generate lots of money for the NWT"
"From the amount of grizzly bears others and I saw in previous trip, a limited amount of non-resident permits could be considered"
"Why you do not allow to hunt grizzly bear? My hunt was very pleasant"
"Most beautiful part of the world. With the most professional outfitter we have been around"
"Well run, beautiful country"
"Fine time with X - guides, food, and accommodations excellent. Trophy and meat care well above average"
"Country is fabulous but I would like to have seen more rams, a lot of country with small amounts of game. Excellent guide with positive attitude"
"Great experience. A happy bow hunter!"
"Grizzly bear and sign everywhere. Why don't you have a limited season?"
"Grizzly bear sign everywhere. Why in God's name don't you have a limited season?"
"Saw 75 Dall's sheep in one day"
"We moved areas too quickly. I was on their last hunt, they were not into the hunt. None of us 4 would use this outfitter or go on the last hunt again"
"I saw a green frog with a pointed nose"
"Should hunt grizzlies"
"Beautiful area, great hunt, I will return!"
"Nice country - lots more sheep seen from air flying in. All sheep seem healthy"
"I am very disappointed in the way the handling of the export permits are being carried out while being forced to deal with Norman Wells"

"Too many bears to feel safe. Ram harvested with good body fat"

"This is the 5th year in a row hunting in the NWT. Checkout system this year requires more hassle. Could be more hunter friendly"

"Excellent outfitter and guide. Appeared to be very concerned about managing the wildlife. Highly encouraged to harvest oldest sheep, not biggest. Highly recommended.

"Would be nice if the outfitter or someone close to the Yukon could do export permits"

"If you are interested in tourists coming to hunt you should look at your export permits to transport meat"

"Weather very bad - discouraging most of the time. We finally had our life time dream fulfilled - got a Dall's sheep with rifle and caribou with bow only to find out that we would not be able to take the horns and meat home due to export permit difficulties"

"Hunting was superb. Outfitter was outstanding. Regulations are far below

"Well organized outfitter. Conscientious guides, excellent food"

"Export permit is a pain in the ass to get. Open a season on grizzly, there are lots of them"

"I would recommend this to anyone!"

"I am surprised at the lack of accommodation to the hunter and the hardships placed on the outfitter, there are many hunters who prefer to take the meat, it would be much more efficient to take the cape and antlers with us, but is too expensive"

"Everything was perfect"

"It would be nice to see a grizzly season as there is a good number of them"

"Only a handful of caribou around. Need grizzly season, and improved cooperation between officers and outfitters with regards to checking out the heads, etc. If you keep up present policies - hunters will go to the Yukon"

"Lots of grizzly bears!"

"We saw lots of bear sign and bears on kills. Country is beautiful and the hunt was good"

"There is a very large population of grizzly, 2 close encounters, bear population is too large and need hunting or they will ruin the caribou herd"

"Lots of grizzly bear problems, can't believe your system for checking heads and meat, it's totally unrealistic - the hassle, time, and money required. Get your act together, you are killing your industry"

"The inability to take my horns, cape, and meat out with me has precluded me from any future hunts in the Territories, it would have taken me 2 times as long and 4 times as much money to go to Norman Wells. I will not book any hunting in the NWT in the future. Open a bear season"

"Grizzly bear population very high. A harvest is needed. Caribou in good shape on the mountain, very spooky and few in numbers"

"Export permit is a very poor system"

"Should open a season for grizzly. Keep local hunters out. Keep politics out of wildlife management. Saw a resident with a grizzly"

"Your existing system of exporting game heads seems to be very backwards it causes lengthy delays and incurs a lot of cost for all parties concerned"

"I sure would like to take my own antlers out of the NWT and would really like to take one of those big bears. Otherwise couldn't ask for better. Love it!"

"Excellent hunt. I did not appreciate the inconvenience that the NWT has put me through concerning the export permits for the game that I harvested. Please get your act together for future hunts!"

"A problem bear had to be shot at camp. It's time to open season on them. There should be more interest in the hunters' needs for meat to take home and available export permits. Hunters are at the low end of your interest and so is hunting in the NWT for me"

"Horn size on Dall's sheep is not very big, need more full curl rams"

" Need to open a grizzly bear season to get rid of some bears that are bothering the hunters and the camps"

"Excellent area and outfitter. I highly recommend both, but there is a lack of cooperation demonstrated by the NWT concerning export permits. I find your actions childish, immature, selfserving, and unprofessional"

"Caribou numbers are inadequate for a quality hunt. Also troublesome bears"

"Your export system stinks. Too much paperwork"

"Substantial numbers of bears, could sustain harvest. Had I known that export permits from NWT were impossible to acquire during my hunt, I would likely have hunted in another province that was more hunter-friendly"

"I feel strongly about eating your meat. Policy on taking out the entire animal isn't well thought out"
"Excellent guides, game, land, and hunt. Hope to return"
"Very professional. Experience was beyond all expectation. Great food, people, horses, gear. First class"
"Beautiful country, lots of game, hunt of a lifetime"
"Lots of caribou, numerous grizzly, spotted at least 1 grizzly per day in Sept. Someone is bound to get mauled"
"I feel strongly about eating your meat; however, the policy on taking the entire animal, the bad meat (shot, destroyed, etc) only causes undue headaches and speeds the spoiling of the food meat. Look at this policy more"
"A wilderness wonder"
"One bear into base camp and stole two pieces of meat"
"Sheep not in real good shape, lots of game"
"The total experience was beyond my wildest expectations, hard working staff, safety conscious, first class, true professionals"
"Bears are prevalent in camp. Need to harvest a few bears"
"I felt the policy of taking all the meat from the kills was very inefficient and ludicrous. Results in a stinky fly-covered mess that takes away from the hunt.
"I had a very good time, saw a lot of game and great country, the weather could have been better and hunt was too short"
"The most beautiful sheep country I have ever seen. I will be back"

Appendix 2. Outfitters and Guides in the Mackenzie Mountains, 1996

Mackenzie Mountain Outfitters

Table 16. Licenced outfitters in the Mackenzie Mountains, 1996

Zone	Company Name	Owner	Approximate Size of Zone (km^2)
G/OT/01	Arctic Red River Outfitters	Kelly Hougen[1]	12,000
S/OT/01	Gana River Outfitters	Bill McKenzie	7000
S/OT/02	Mackenzie Mountain Outfitters	Stan Stevens	12,750
S/OT/03	Ramhead Outfitters	Stan Simpson	16,300
S/OT/04	NWT Outfitters	Duane Nelson	7250
S/OT/05	Redstone Trophy Hunts	David Dutchik	11,250
D/OT/01	South Nahanni Outfitters	Rick Furniss	19,000
D/OT/02	Nahanni Butte Outfitters	Greg Williams	8833

[1] President, Association of Mackenzie Mountain Outfitters,
P.O. Box 5988,
Whitehorse, Yukon Y1A 5L7

Big Game Hunter Guiding in the Mackenzie Mountains

At least 85 different people provided licenced guiding services to non-resident big game hunters in the Mackenzie Mountains in 1996. While most hunters use only one guide for their hunt, sixteen hunters used two guides, and one used three guides. The majority of guides (22.4%) only guided for one hunter; the largest number of hunters that one guide lead in 1996 was 11 (Table 17). Only seven guides (8.2%) guided for more than 7 clients.

Table 17. Numbers of hunters guided by licenced big game hunting guides in the Mackenzie Mountains, NWT, 1996

Number of Hunters Guided	1	2	3	4	5	6	7	8	9	10	11
Number of Guides	19	7	12	6	10	10	14	2	1	3	1

Appendix 3. Dall's Sheep Harvest, Ages, and Horn Measurements 1965-1996

Table 18. Numbers of sheep harvested, mean ages (by horn annuli), and right horn total length measurements of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 1965-1996.

Year	Number of Sheep Harvested	Age (Years)		Total Length of Right Horn	
		Mean	Sample Size	Mean	Sample Size
1967-1968	168	8.4	unknown	86.4	168
1979	200	-	-	90.7	159
1980	180	-	-	89.9	127
1981	187	8.1	101	93.7	157
1982	126	8.7	98	89.7	124
1983	100	9.0	80	90.9	94
1984	102	8.4	198	91.2	99
1985	123	8.1	115	89.7	112
1986	154	8.8	132	88.4	153
1987	148	8.9	153	89.4	148
1988	177	9.8	166	91.7	161
1989	207	9.9	199	90.4	203
1990	219	9.8	200	90.2	218
1991	170	9.7	161	89.1	170
1992	203	9.7	199	88.0	202
1993	191	9.7	181	87.6	190
1994	195	9.5	191	88.6	196
1995	190	9.7	189	89.3	189
1996	201	9.5	200	88.8	204

Data for 1967-1968 from Simmons (1969), for 1979-1990 from Latour and MacLean (1994), for 1991-1994 from DRWED unpublished file data, and 1995 from Veitch and Popko (1996).

Table 19. Age Structure of Dall's Sheep Rams Harvested by Non-resident and Non-resident Aliens in the Mackenzie Mountains, NWT: 1991-1996.

	1996		1995		1994		1993		1992		1991		Total	
Age	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
3	1	*0.5*	0	*0.0*	0	*0.0*	0	*0.0*	0	*0.0*	0	*0.0*	1	*0.1*
4	0	*0.0*	0	*0.0*	0	*0.0*	1	*0.6*	0	*0.0*	0	*0.0*	1	*0.1*
5	1	*0.5*	1	*0.5*	0	*0.0*	1	*0.6*	1	*0.5*	2	*1.2*	6	*0.5*
6	5	*2.5*	4	*2.1*	7	*3.7*	8	*4.4*	8	*4.0*	8	*5.0*	40	*3.6*
7	21	*10.5*	16	*8.5*	32	*16.8*	23	*12.7*	21	*10.6*	22	*13.7*	135	*12.0*
8	47	*23.5*	49	*25.9*	36	*18.8*	24	*13.3*	46	*23.1*	30	*18.6*	232	*20.7*
9	56	*28.0*	51	*27.0*	42	*22.0*	51	*28.2*	46	*23.1*	30	*18.6*	276	*24.6*
10	36	*18.0*	34	*18.0*	43	*22.5*	29	*16.0*	33	*16.6*	22	*13.7*	197	*17.6*
11	26	*13.0*	14	*7.4*	17	*8.9*	27	*14.9*	23	*11.6*	28	*17.4*	135	*12.0*
12	6	*3.0*	14	*7.4*	10	*5.2*	10	*5.5*	16	*8.0*	12	*7.5*	68	*6.1*
13	1	*0.5*	5	*2.6*	0	*0.0*	7	*3.9*	2	*1.0*	5	*3.1*	20	*1.8*
14	0	*0.0*	1	*0.5*	4	*2.1*	0	*0.0*	2	*1.0*	2	*1.2*	9	*0.8*
15	0	*0.0*	0	*0.0*	0	*0.0*	0	*0.0*	1	*0.5*	0	*0.0*	1	*0.1*
Total	200	*100.0*	189	*100.0*	191	*100.0*	181	*100.0*	199	*100.0*	161	*100.0*	1121	*100.0*
<8-yrs	??		??		??		??		??		??		??	
%<8-yrs	*ERR*		*ERR*		*ERR*		*ERR*		*ERR*		*ERR*		*ERR*	
>10-yrs	69		68		74		73		77		69		430	
%>10-yrs	*34.5*		*36.0*		*38.7*		*40.3*		*38.7*		*42.9*		*38.4*	
>12-yrs	7		20		14		17		21		19		98	
%>12-yrs	*3.5*		*10.6*		*7.3*		*9.4*		*10.6*		*11.8*		*8.7*	